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IN THE SPECIFICATION

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~~Table 2~~ Table 1 provides the formulation for the five dispersions that were used in the Examples.

~~Table 2.~~ Table 1.

Dispersion	Type of Carbon Black			
	Conventional (Monarch 1300[1])	Highly Conductive (Printex XE-2[2])	Highly Conductive (Conductex SC Ultra[3])	Highly Conductive (Vulcan XC72[1])
1	38 grams			
2	26.6 grams	11.4 grams		
3	26.6 grams		11.4 grams	
4	26.6 grams			11.4 grams
5		38 grams		

[1] Available from Cabot Corporation
[2] Available from Degussa-Huls AG
[3] Available from Columbian Carbon Company

Example 1

Hull cell chain panels were processed through the following sequence for the indicated times:

1) Blackhole® conditioner SP (30 seconds)
2) Rinse, deionized water (30 seconds)
3) Carbon black dispersion (45 seconds)
4) Air/dry heat treatment at 40 °C (2 minutes)
5) Blackhole® microclean (45 seconds)
6) Rinse, deionized water (30 seconds)
7) Air dry

8) 10% H_2SO_4 (30 seconds)

9) Electroplating with Macuspec® 9280/85 copper solution in a Hull cell (5 minutes)

10) Rinse, deionized water (30 seconds)

11) Air dry

After treatment with this sequence of baths, the holes in each panel were examined. The numbers of electroplated through holes are shown in ~~Table 3.~~ Table 2.

~~Table 3.~~ Table 2. Number of holes electroplated

	Number of holes electroplated
Dispersion 1	7.5
Dispersion 2	12.5
Dispersion 3	12
Dispersion 4	11

Example 1 demonstrates that the presence of highly conductive carbon blacks in the carbon dispersion improves propagation of the through holes in the printed circuit board.

Example 2

Hull cell chain panels were processed through the same sequence of procedures as in Example 1 using dispersions 1, 2, and 5 for carbon coating. The numbers of electroplated holes are shown in ~~Table 4.~~ Table 3.

~~Table 4.~~ Table 3. Number of holes electroplated

	Number of holes electroplated
Dispersion 1	6
Dispersion 2	10
Dispersion 5	4

Example 2 demonstrates that a blend of conventional carbon black and highly conductive carbon black is preferred to achieve faster propagation. When highly conductive carbon black is used solely as the carbon black in the dispersion (dispersion 5), propagation is slower than with conventional carbon coating due to the excess amount of dispersing agent that is needed to disperse the highly conductive carbon black. Since highly conductive carbon black has less oxidized species on the surface as compared to conventional carbon black, it is very hydrophobic and requires a larger amount of dispersing agent. Dispersing agent decreases conductivity by increasing interparticle resistance.

Example 3

Hull cell chain panels were processed through the same sequence of procedures as in Example 1 except that different acid copper solutions were used for electroplating. Dispersions 1 and 2 were used for carbon coating. The number of electroplated holes are shown in ~~Table 5.~~ Table 4.

~~Table 5.~~ Table 4.

	Number of holes electroplated		
	Macuspec® 9280/85	Macuspec® PPR	Hispec®
Dispersion 1	7.5	2.5	9
Dispersion 2	12.5	6.5	14

Example 3 shows that the use of highly conductive carbon black improves propagation through holes when electroplated with various acid copper plating solutions.

Example 4

Hull cell chain panels were processed through the same sequence of procedures as in Example 1, except that the heat treatment step after carbon coating (step __4__) was omitted. Dispersions 1 and 2 were used for carbon coating. The number of electroplated holes are shown in ~~Table 6.~~ Table 5. Macuspec® 9280/85 copper solution was used for electroplating. Heat treated panels were also plated as comparative examples.

~~Table 6.~~ Table 5.

	Number of holes electroplated	Copper coverage in the plated through holes
Dispersion 1 (heat treated)	8	good
Dispersion 1 (no heat treatment)	6.5	poor
Dispersion 2 (heat treated)	11	good
Dispersion 2 (no heat treatment)	11.5	good

Example 4 shows that the heat treatment step can be eliminated when highly conductive carbon black is used in the dispersion for carbon coating due to the superior adhesion of highly conductive carbon black to the non-conductive resin/glass substrate. When conventional carbon blacks are used, the heat treatment step becomes necessary to achieve acceptable coverage and conductivity. Example 4 also demonstrates that the use of highly conductive carbon black improves propagation through holes when electroplated.

Example 5

Double-sided boards (copper foil is laminated to opposite sides of an epoxy resin/fiberglass composite; total thickness = 0.0625 inches) with various sized holes (0.02 to 0.2 inches in diameter) drilled through. The double-sided boards were prepared for electroplating by mechanically scrubbing the copper surfaces of the board, followed by desmearing.

The desmeared double sided panels are processed through the same sequence of procedures as in Example 1, except that the heat treatment step after carbon coating was omitted. Dispersions 1 and 2 were used for carbon coating. The panels were electroplated in Hispec® acid copper plating solutions for 1.5 minutes and cut through holes to examine copper coverage on the surface of the holes. Heat treated panels were also plated as comparative examples.

Electroplating after carbon black treatment begins adjacent to the copper foil in outer surfaces of the printed circuit boards and extends inward towards the center of the hole. When electroplated copper from both sides of the through hole contact in the center, it is called bridging. When double-sided panels are plated for a certain time in a same condition, a greater number of "bridged" holes indicates a superior propagation rate. The number of "bridged" holes, is shown in ~~Table 7.~~ Table 6.

~~Table 7.~~ Table 6.

	No. of bridged holes out of 7 holes (0.120 inch holes)	**No. of bridged holes out of 15 holes (0.035 inch holes)**
Dispersion 1 (heat treated)	5	12
Dispersion 1 (no heat treatment)	1	8
Dispersion 2 (heat treated)	7	15
Dispersion 2 (no heat treatment)	7	15

Example 5 shows that the heat treatment step can be eliminated when highly conductive carbon 'black is used for carbon coating. When conventional carbon black is used, the heat treatment step becomes necessary. This example also proves that the use of highly conductive carbon black improves propagation of through holes when electroplated.